



The Flipped classroom in the learning of korfball in fifth and sixth grade

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Flipped Classroom para el aprendizaje del Korfball en el ciclo superior de Educación Primaria

Resumen. El Flipped Classroom (FC) es un modelo que ha tenido una gran aplicación en estos últimos años. Aun así, pocos son los estudios que demuestren la mejora de los resultados académicos con su aplicación, en especial, en el ámbito de la educación física y en la etapa de Educación Primaria. Este estudio se centra en el tercer ciclo de educación primaria, con el objetivo principal de comparar una propuesta didáctica del Korfball a través del FC con otro grupo (control) sin esta metodología. Los datos se han obtenido a partir de tres instrumentos y en tres momentos del trimestre, y muestran diferencias significativas en el aprendizaje de conocimientos en torno al Korfball, concretamente, en las normas y la aplicación de la estrategia del juego durante su práctica, donde los estudiantes con FC puntúan más alto. En términos de género, el Korfball parece minimizar las diferencias de evaluación entre niños y niñas. Este estudio puede ser útil para implementar nuevas propuestas en el aula de educación física, y para seguir progresando en el estudio de los beneficios del FC y la aplicación del Korfball en la Educación Primaria.

Palabras clave: Aula Invertida; Korfball; educación física; Educación Primaria; Innovación Educativa; género

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Summary. The Flipped classroom (FC) model has come into widespread use in recent years. However, there are few studies showing the improvement of academic results with the implementation of this model, particularly in the field of Physical Education and, even more specifically, in Primary Education. The main goal of this research, which is focused on the third cycle of Primary Education (fifth and sixth grades), is to compare the results of a didactic proposal for the teaching of Korfball via an FC model with those of another group (control). Data were collected with three instruments and at three points in the academic term. Results show significant differences in Korfball performance and, more specifically, in the rules and the application of game strategy during game play, when students with FC scored higher. In terms of gender, Korfball seems to minimize the differences in the results of assessment between boys and girls. This study could be useful for teachers wishing to implement new proposals in the Physical Education classroom and, additionally, for researchers interested in studying of the benefits of FC and the application of Korfball in Primary Education.

Keywords: Flipped classroom; Korfball; Physical Education; Primary Education; Innovation in education; Gender

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Introduction

The contemporary trend toward greater integration of technology into education has led to the emergence or reinvention of a wide range of educational models and methodologies. What these different methods have in common is active learning by students and the use of technology. One such active learning trend is the flipped classroom (FC) model. This method is sparking a paradigm shift when it comes to the use of technology in education, wresting the leading role in learning away from teachers and handing it over to students (Sohrabi & Iraj, 2016). The FC is often described as a teaching strategy whereby students view videos to access instructional contents before class. This, however, is a highly superficial and oversimplified vision of the method. Meanwhile, a number of researchers have conducted studies on a range of aspects related to the method's effectiveness in the field of physical education (Ferriz, Sebastià & García-Martínez, 2017). The aim of this study is to analyse how FC can be used to improve learning of a sport such as korfbal for students in fifth and sixth grade. This sport exposes students to new challenges that allow them to enhance their motor skills in a fun and motivating way (Fierro, Haro & García, 2016). The study also represents an opportunity to examine the role played by gender, as the students will play on mixed-gender teams.

Flipped classroom

The flipped classroom paradigm or teaching was pioneered by Bergmann and Sams (2012). After concluding that they needed to institute some changes in their classrooms, in 2007 they began to apply this new teaching and learning model. The methodology is founded on constructivism and Bandura's (1977) theory of social learning. When this method is used, instead of presenting subject matter to students via lectures during class, teachers give them asynchronous access to materials such as videos covering these contents. In this way, students engage in lower cognitive level activities (according to Bloom's taxonomy; Bloom, Englehart, Furst, Hill & Krathwohl, 1956), while class time is set aside for activities demanding a higher cognitive level, such as application, analysis, evaluation and creation. Stu-

dents learn through practical learning activities, working to answer questions designed to foster their critical thinking and creative problem-solving competencies. They are able to delve into the subject matter through class discussion, which makes class sessions more enjoyable and interactive (Baepler, Walker & Driessen, 2014; O'Flaherty & Phillips, 2015; Tourón & Santiago, 2015).

FC methodology helps create a classroom atmosphere where students are the driving force behind their own learning process. The FC represents a transfer of ownership of the learning process from teachers to students (Sohrabi & Iraj, 2016), and it helps to develop students' autonomy, as the students themselves have the opportunity to set their own priorities. It is also a flexible learning methodology, offering the advantages of both in-person and distance learning (Wanner & Palmer, 2015).

Research into the implications of FC methodology on academic performance has yielded some contradictory results. By way of review of this research, we have analysed and classified the results of prior studies. As is clear from Figure 1, the studies with positive results outnumber the ones that have found negative effects. This is also the case for studies of university students, about whom there is a much greater body of published research. The most prevalent disciplines in the studies are medicine and health sciences.

The very inventors of the FC have helped lead an evolution of the concept toward the idea of flipped learning (FL) (Sams & Bergmann, 2013; Bergmann & Sams, 2014). These authors describe FC as a pedagogical approach wherein direct instruction is transferred from the group learning space to the individual learning space. This allows the group space to become a setting for more dynamic and interactive learning, where the teacher guides the students as they apply the concepts they have learned and engage creatively with the subject matter.

As Sargent y Casey (2019) have pointed out, there has been very little study of FL in the field of physical education, and there is a lack of clear information on how the teachers of this subject view the potential for applying this method in their classrooms. Some of the most significant studies (Bergmann & Sams, 2014;

Table 1. Studies with positive and negative academic results

Educational stage	Subject area	Positive results for academic performance or learning	Inconclusive or no improvement in academic results
University	Medicine	Chen et al. 2018; El-Banna, Whitlow & McNelis, 2017; McLaughlin et al., 2014; Moraros, Islam, Yu, Banow, & Schindelka, 2015; Tune, Sturek, & Basile, 2013	Jensen, Kummer, & Godoy, 2015
	Chemistry	Baepler, Walker, & Driessen, 2014; Fautsch, 2015	
	Computer skills	Davies, Dean & Ball, 2013	
	Pharmacy	Wong, Ip, Lopes, & Rajagopalan, 2014	
	Statistics	Wilson, 2013	Boevé et al. 2017
	IT		Çakıroğlu & Öztürk, 2017
	English as a second language	Hung, 2015	
	General or various	Chen, Wang, & Chen, 2014; Long et al., 2017	
High school	Mathematics	Borao & Palau, 2016; Fornons & Palau, 2016	Clark, 2015
	Language	Borao & Palau, 2016	

García, Castro & Morales, 2015; Morilla & Palau 2015; Barker, Wallhead & Quennerstedt, 2016; Heinerichs, Pazzaglia & Gilboy, 2016; Killian, Trendowski, & Woods 2016; Zainuddin & Halili, 2016; Østerlie, 2016; Østerlie, 2018) have yielded positive results, indicating that the FC and FL contribute to increasing the class time devoted to practical activities and afford teachers with more opportunities to offer feedback. This literature also shows that the approaches promote enhanced interactions and discussion in class because the students are better prepared, and they lead to improved academic results and better relations between students and teachers. Hahnstadt (2014) has said that there are special obstacles to the implementation of the FC in physical education, because historically students have not tended to receive homework for this class, and some students perceive it to be less academically rigorous. There has been some research into the FC at the fifth and sixth grade level. A prominent study by Ferriz, Sebastià and García-Martínez (2017) assessed the effects of applying the FC method in fifth and sixth grade classrooms and in A level (*Bachillerato*) classes using a test to measure prior physical education knowledge. The results did not indicate any significant differences between the FC group and the traditional group with regard to the attainment of learning standards in the final assessment test.

Emerging methodologies in physical education

Ever since Mosston (1966) published his study of the spectrum of teaching styles, there has been a steady stream of new proposals and models for teaching (Joyce & Weil, 1972; Jewwet & Bain, 1995; Metzeler, 2011). In the present context, the dominant teaching models are centred on meeting the needs of students, seeking to ensure that learning results are suited to these needs (Casey, 2016).

As Fernández-Río et al. (2016) observed in their review of physical education teaching models (following up on the work of Haerens et al., 2011), a wide range of models are in use with a great deal of flexibility. The aim of many of these approaches is for students to acquire the degree of responsibility and autonomy they need in order to come to an understanding of physical activity as an integral part of their lives.

In this same vein, Lleixà (2017) has observed that the current trend in physical education consists of a focus on improving the efficiency of educational interventions in classes through the use of innovative pedagogical approaches, with the aim of promoting the importance of physical activity and its role in health and the community. This improved efficiency is also aimed at encouraging students to participate more in class sessions.

The goal, then, is to create educational interventions that grant students the role of protagonists of the teaching and learning process, as Siedentop, Hastie and Van der Mars (2004) have written. At the same time, there is a desire to shape educational contexts that

allow students greater involvement in managing their learning processes. The underlying belief is that all of this will increase students' engagement with the materials and the practical application of the subject matter.

While the use of these methodologies in the field of physical education is already a reality, the use of ICT in this field is still in its infancy (Kretschmann, 2015), even though this technology has a key role to play in helping students develop the competencies mentioned above. In fact, ICT is already an integral part of physical education teachers' professional training. Nonetheless, there is much to be done to help teachers develop the competency to apply these technologies in class (Papastergiou, 2010).

Korfbal in primary school physical education

Games and sports are an integral part of physical education, and they can be used to serve a number of different educational purposes throughout the different stages of primary education. The legal framework that regulates the physical education curriculum in Catalonia, based on official Decree 119/2015, of June 23, makes reference to a number of core principles, including fairness, equality and respect. As Usabiaga and Martos-García (2012) have observed, teachers have some room to be flexible with their programming and curricular planning and can select the kinds of activities that are best suited to a given context and student body. Nonetheless, these authors point out, the official course programmes remain quite conventional, and they feature mainly the small group of sports that receive the most attention from the mass media (Borrego, Carrillo & Díaz, 2015). Consequently, there is often little opportunity for other kinds of sports to find a place in physical education classes, and the potential educational benefits of these additional sports often go unrealised. These "alternative" sports, as some authors call them (Barbero, 2000; Requena, 2008; Stidder & Hayes, 2017), actually have much to offer. They have the potential to help students work toward a wide range of competencies, some of them specific to the field of physical education and others which are basic competencies applicable across educational disciplines. Korfbal falls into this category of alternative sports. Although the sport has common origins with basketball, Van Bottenburg and Vermeulen (2011) recount how it has developed along a very different path and played a very different role in the sport world and in education. There are several reasons for these divergent histories, but this is not the subject of this research. What is relevant to this paper is the role that korfbal plays in the context of physical education in schools. According to Fernández-Río and Méndez-Giménez (2015), one of the best ways to introduce physical education students to these kinds of sports is through educational approaches based on cooperative learning.

Castejón Oliva (2015) has written along similar lines, suggesting the possibility of creating new ap-

proaches to physical education teaching based on reflection and applying the ideas of comprehensive learning, a model that seeks to work in an integrated fashion on the cognitive, affective-social and motor skill dimensions.

In addition to all of these factors, Fierro, Haro and García (2016) have underlined a number of other characteristics and potential benefits of alternative games and sports, advantages that korfbal clearly embodies. These sports are an excellent fit for primary school physical education classes for a number of reasons. They involve new challenges to students' motor skills, and they are fun and motivating activities that help create an ideal educational setting, an atmosphere where recreation takes precedence over competition. They also enhance equality of opportunities and help motivate groups that who participate less in class, and they nurture the growth in the classroom of values such as team spirit, respect, cooperation and equality. Finally, they bring to the classroom nonspecific materials, which can be used in new ways, and they contribute to an improvement in students' motor skills. Gubby (2018) details a number of arguments in favour of using korfbal in education. One of the key reasons he cites is the sport's contribution to cooperation and gender equality, with boys and girls participating at the same level. In analyses of the sport, influential authors were already citing its potential from a gender perspective as far back as several decades ago (Crum, 1988; Summerfield & White, 1989).

Objectives and hypothesis

The overall objective of this study was to determine whether the use of FC methodology in the teaching of korfbal improves fifth and sixth grade students' physical education learning. With regard to this objective, the following two hypotheses were posed:

H1: The students in the FC group attain better results in terms of knowledge of korfbal and application of this knowledge.

H1a: The students in the FC group will attain better scores on the objective korfbal test.

H1b: The students in the FC group will attain better marks on the assessment of their korfbal play.

H1c: The students in the FC group will attain better self-assessment scores on their knowledge of korfbal.

H2: The results of the objective tests, the game play assessment and the self-assessment will not display any differences in terms of gender.

Method

Participants

This study consists of the analysis of quantitative data on the application of the FC method in two fifth and

sixth grade classrooms at a public early childhood and primary education school, Escola Jacint Verdaguer in Castelldefels. This school is located in the centre of the city and has an established track record of educational innovation, mostly in the use of technology to improve the teaching and learning process. Korfbal was chosen because none of the students in the study was familiar with the sport and because it features the equal participation of boys and girls.

This school has only one class of students for each grade level. Thus, the study (see Tabla 2) was carried out with a sample of N=50 primary education students during the first trimester of the academic year. The first group (N=25) was made up of 11 girls 14 boys in fifth grade (flipped classroom group), with a mean age of 10 ($SD=0.00$), and the second group (N=25) consisted of 7 girls and 16 boys in sixth grade, with a mean age of $M=11.04$ ($SD=0.20$) (control group). The two groups had the same physical education teacher, the same number of sessions and the same assessment model (see next section below).

Research instruments

Observation rubric. The teacher carried out an individualised observation process of the students in the two groups during the practical sessions in which they played korfbal. The observer recorded information on various aspects of the students' game play:

1. Collaborates with classmates
2. Respects the rules of the sport
3. Is familiar with the rules
4. Uses team strategy.

Each student was awarded a score of 0, 1 or two, depending on whether a given behaviour was observed always, sometimes or never. In accordance with the design of the study, the rubric used was wholly quantitative, and as such, no notes or other qualitative information were taken into account.

KPSI (Knowledge and Prior Study Inventory). This is a self-assessment instrument in which self-regulation is predominant. It has been found to be a valid and reliable tool for the measurement of students' development in terms of competencies (Tamir & Amir, 1981). In this study, the instrument was designed with six items based on a series of concepts connected with korfbal. For example, they were asked questions such as, "What is the field of play like?" Students were asked to assign themselves one of four values for each item:

1. I can't explain it.
2. I know it, but I can't explain it.
3. I could explain it briefly.
4. I have a good command of the topic.

Final test. Online test featuring true/false questions that was administered to the two groups of students. An example question: "True or false? 1.- Korfbal is a sport that only boys can play". The students were told to answer all the items (10) and that they would not lose points for wrong answers.

Table 2. Descriptive statistics

N = 50	Min	Max	Mean	SD	Skewedness	Kurtosis		
Age	10	12	10.52	.544	.315	.337	-1.106	.662
O1. Collaborates	0	2	1.860	.405	-3.048	.337	9.483	.662
O2. Respects	0	2	1.760	.476	-1.829	.337	2.657	.662
O3. Familiar	0	2	1.840	.422	-2.721	.337	7.353	.662
O4. Strategy	0	2	1.600	.670	-1.442	.337	.808	.662
Result	6	10	8.500	1.555	-.390	.337	-1.473	.662
Q1. Field	1	2	1.020	.141	7.071	.337	50.000	.662
Q2. N. pla.	1	3	1.080	.340	4.638	.337	22.600	.662
Q3. Def.	1	1	1.00	.000				
Q4. Score	1	1	1.00	.000				
Q5. Fouls	1	1	1.00	.000				
Q6. Match	1	4	1.420	1.052	2.140	.337	2.684	.662

Procedure

The fifth and sixth grade physical education teacher was responsible for designing and implementing using FC methodology with the aim of teaching the students the principles of korfbal. This methodology was used with the FC group from the start of the first trimester, while control group used same the traditional in-person physical education methodology that had been used in previous years. These traditional methods included direct instruction, assignments, demonstrations, etc., without any extra materials for the students with regard to korfbal. The members of both groups were unfamiliar with this sport. Because none of the students in the sample had any prior knowledge of the sport, no pre-test of their knowledge was administered.

The onsite sessions were the same for both groups throughout the term. The difference was that the fifth-grade group used the FC model. The students were asked to watch a video at home before each session. The videos were selected by the *Federació Catalana de Korfbal* and the *International Korfbal Federation*. They were made available to the students via the school's online educational platform so that they could be easily accessed from whatever devices the students chose to use. The sixth-grade group did not use the FC method. In this group, the teacher devoted the beginning of each session to an explanation of the same contents or rules that the fifth-grade class had seen in the videos. This continued throughout the term. The difference between the classes was that the experimental group was able to devote all the class time to practical activities, while the control group dedicated part of each session to explanations by the teacher, leaving them less time for practice.

The classes included different methodologies and forms of organisation. For example, students played games some aimed at practicing all the educational contents of the unit and others that were designed to allow them to practice specific technical gestures. The first two sessions included an opportunity for free exploration by the students, and we were able to observe that the FC group requested less time for exploration, probably because of the information they had received prior to class.

Finally, the groups were given assignments during the final sessions to prepare them to play and compete.

The type of group formed was determined by the methodology used in each session: pairs, small groups, teams or the whole group together.

By way of assessment, the teacher took notes on the performance of each student during the class sessions according to the observation rubric. The students were also assessed via the knowledge test and the self-reflection questionnaire on korfbal (see section above).

Data analysis

The data were entered anonymously into a database in order to ensure that they study was in keeping with the ethical principles associated with the protection of students' data. Later, the data were sorted so as to be analysed using SPSS 22.0. Descriptive (frequencies, central tendency and dispersion) and normality (skewedness and kurtosis) calculations were carried out for the sample. After this initial step, bivariate correlations were measured using Spearman's Rho. Finally, the Mann-Whitney U test was used to test the study's hypotheses. The sum of ranges test is a nonparametric test applied to two independent samples. It was decided to use this calculation tool because each of the groups had $N < 30$ students and the distribution was not normal for the quantitative variables. Otherwise, we had to analyse ordinal variables ("observation" and KPSI). This nonparametric test is the most frequently used technique under these circumstances (Sheskin, 2007).

Results

Descriptive statistics

Table 2 shows that the ages of the students in the sample ranged from 10 to 12 ($SD=0.54$). This variable was not taken into account for the purposes of the analysis, as the students displayed no significant differences with regard to motor skill development and were all unfamiliar with the sport that was the focus of the unit. The average score for the final test was quite high ($M=8.50$; $SD=1.55$). The results of the observation dis-

Table 3. Correlations in the sample of students (Spearman's Rho), with regard to the final test, self-assessment and teacher observation instrument.

	1	2	3	4	5	6	Q1	Q2	Q6	7
1.Gender	1.00	.167	-.277	-.299*	-.185	-.081	.107	.189	.183	-.056
2.Group		1.000	-.248	-.152	-.403**	-.336*	.143	.253	.173	-.848**
3.Collaborates			1.000	.711**	.406**	.053	.053	-.419**	-.372**	.157
4.Respects				1.000	.368**	.203	.076	-.267	-.330*	.023
5.Familiar					1.000	.432**	.058	-.413**	-.186	.294*
6.Strategy						1.000	.092	.003	.112	.274
Q1 Ter. J.							1.000	-.036	.354*	-.052
Q2 N pla.								1.000	.150	-.191
Q6 Match									1.000	-.088
7.Final score										1.000

*The correlation is significant at the level of 0.05 (bilateral). **. The correlation is significant at the level of 0.01 (bilateral).

played a greater degree of variability than those of the final test, on which all the students received scores of 1 for Q3, Q4 and Q5. These questions were thus excluded from the subsequent analysis. The skewedness and kurtosis values confirm that none of the variables had a normal distribution. The choice of nonparametric analysis was thus validated.

Correlations

The nonparametric coefficient Spearman's Rho (rather than another method such as Kendall's Tau) was chosen to study the correlations between the variables because this method is much more sensitive to errors or discrepancies in the data, in addition to being the most frequently used method (Sheskin, 2007). The Spearman's Rho values were compared both with those for Kendall's Tau de Kendall and for the parametric correlation, and no significant differences were found among them.

There is a positive and significant correlation between the group and the final assessment: the experimental (FC) group scored higher on this test than the control group (see Table 3). There was also the same kind of correlation between the group and two of the dimensions of the observation rubric: "Familiar" and "Uses strategy". Gender correlated only with "Respects" on the observation rubric, with girls scoring higher than boys for this dimension. Finally, with regard to the final questionnaire, the responses to Q2 displayed a correlation with "Collaborates" and "Familiar", and those to Q6 correlated with "Collaborates" y "Respects". All of these correlations were negative. Finally, there was also a significant positive correlation between the results of the final test and the dimension of the observation tool called "Familiar".

Associations

In order to tests the two hypotheses of this study, nonparametric analysis was used to calculate the differences between the two groups and any differences with regard to gender. This analysis found a relationship between the group and the score on the final test. The FC group scored significantly higher than the control group. After the correlation study, an analysis

of the Mann-Whitney U test results was carried out. The values displayed in Table 3 show that there was a significant difference between the distribution on the final test between the FC group and the control group. In other words, the results for the group whose class had used the new methodology recorded significantly better results. This allows us to confirm hypothesis H1a "The students in the FC group will obtain better results on the objective korfbal test," with a significance level of $p < 0.05$.

However, for H1b, "The students in the FC group attain better marks on the assessment of their korfbal play", was not wholly borne out by the data, as the FC group recorded significantly higher scores only for observation dimensions O5 (knowing the rules) and O6 (using strategy)

Meanwhile, H1c, "The students in the FC group will attain better self-assessment scores on their knowledge of korfbal," was not ultimately supported by the data, either. The results for Q1, Q2 and Q6 did not display any correlation with the group (Table 3), nor were any significant differences apparent from the nonparametric analysis (Table 4).

For H2, "The results of the objective tests, the game play assessment and the self-assessment will not display any differences in terms of gender," the analysis of associations shown in Table 4 indicates no differences with regard to the variable of gender for any of the tests ($p > .05$).

Discussion

The aim of this research was to analyse whether the use of FC methodology has a positive effect on the korfbal learning results of fifth and sixth grade students when compared with the effects of a more traditional methodology. The study focused on educational contents with which the students had no prior familiarity (korfbal). The final results showed that the students in the FC group scored significantly higher on the objective korfbal test than the students in the group using the traditional teaching method. These results would seem to conflict with those found in an earlier study by Ferriz, Sebastià and García-Martínez (2017) of fifth, sixth and eleventh grade students. These researchers did not find any significant differences.

Table 4. Ranges and Mann-Whitnet U test for the experimental (FC) and control (GC) groups

	Group Control		Group Experimental		U	p
	n	Range	n	Range		
O1. Collaborates	25	23.48	25	27.52	262.00	.082
O2. Respects	25	23.92	25	27.08	273.00	.287
O3. Familiar	25	22.00	25	29.00	225.00	.005**
O4. Strategy	25	21.60	25	29.40	215.00	.019*
Q1. Playing field	25	26.00	25	25.00	300.00	.317
Q2. Number players	25	27.00	25	24.00	275.00	.077
Q6. Match	25	27.00	25	24.00	275.00	.226
Final score	25	13.88	25	37.12	22.00	.000**

a. Variable de agrupación: Group, $p < 0.01^{**}$; $p < 0.05^{*}$

Table 5. Ranges and Mann-Whitney U test by gender

	Girls		Boys		U	p
	n	Range	n	Range		
O1. Collaborates	18	28.50	32	23.81	234.00	.053
O2. Respects	18	29.64	32	23.17	213.50	.036*
O3. Familiar	18	27.64	32	24.30	249.50	.196
O4. Strategy	18	26.75	32	24.80	265.50	.572
Q1. Playing field	18	25.00	32	25.78	279.00	.453
Q2. Number players	18	24.00	32	26.34	261.00	.185
Q6. Match	18	23.39	32	26.69	250.00	.201
Final score	18	26.53	32	24.92	269.50	.694

a. Variable de agrupación: Gender, $p < 0.01^{**}$; $p < 0.05^{*}$

This departure from prior results may have to do with the choice of sport, as we will discuss below. In our study, we found a positive link between the FC method and improved scores both for knowledge of korfbal in general and for the application of strategy during game play. These findings echo a previous contribution to the field by Yarbrow, Arfstrom, McKnight y McKnight (2014). Although in our study the methodology was applied only for a limited period of time, the use of this educational model was successfully in contributing to the students' conceptual understanding of the game and its structure and components. It is important to highlight that the students who had studied using the FC methodology had obtained improved results in terms of knowledge of the rules and application of strategy. In other words, these students were more effective when they had to take decisions based on the unfolding action of a particular game. This improved performance may be due to the combination of autonomous work outside the classroom with work during class time. Alternatively, it may be the case that viewing videos at home had offered two benefits: they were able to get a better grasp on the rules and strategies involved in the sport, and they had more time in class to practice them. These findings are in the same vein as the conclusions of a study by Wanner and Palmer (2015).

With regard to the second hypothesis, our study found no differences in terms of gender. The only significant correlation found for this variable was with the "Respects" dimension of the observation rubric, with girls scoring higher. In fact, girls recorded higher scores for all the dimensions of this instrument, while on the final self-assessment boys registered higher scores. This issue has received attention from earlier

authors such as Summerfield and White (1989) and Crum (1988). Future studies should examine this result in terms of self-perception. However, we believe that the differences in self-assessment might be associated with the characteristics of korfbal itself. As such, it would be of interest to conduct more in-depth research along the lines of the study by Gubby (2018).

Conclusion

The use of FC methodology in fifth and sixth grade physical education classes (specifically to learn korfbal) yielded positive results in terms of the learning of theoretical knowledge and the use of the strategic elements of the game. The results show no significant differences with regard to gender. These findings may be of interest to teachers wishing to implement this methodology in the physical education classroom, as it can help to optimise the use of class sessions, offering additional time for practical activities involving the use of physical and motor skills. This allows students to be more active in class, as the time spent on explanation is reduced. It also fosters personal autonomy and responsibility among students thanks to their work outside the classroom prior to the sessions.

References

- Baepler, P. M., Walker, J. D., & Driessen, M. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers and Education*, 78, 227-236. doi:10.1016/j.compedu.2014.06.006
- Barker, D., Wallhead, T., & Quennerstedt, M. (2014). Student learning through interaction in physical

- education. *European Physical Education Review*, 20(4), 536–537. doi:10.1177/1356336x14544087
- Barbero, J. C. (2000). Los juegos y deportes alternativos en Educación Física. *Lecturas: Educación Física y Deportes, Revista Digital*, 22. <http://www.efdeportes.com/efd22a/altern.htm>
- Bergmann, J., & Sams, A. (2012). *Flip Your Classroom: Reach Every Student in Every Class Every Day* (pp. 120-190). Washington DC: International Society for Technology in Education.
- Bergmann, J., & Sams, A. (2014). *Flipped learning: Gateway to student engagement. International Society for Technology in Education.*
- Bloom, B. S., Englehart, M. B., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives. *The classification of educational goals. Handbook I: Cognitive domain*. New York: Longmans Green.
- Boevé, A. J., Meijer, R. R., Bosker, R. J., Vugteveen, J., Hoekstra, R., & Albers, C. J. (2017). Implementing the Flipped Classroom: An exploration of study behaviour and student performance. *Higher Education*, 74(6), 1015-1032. doi: 10.1007/s10734-016-0104-y
- Borao, L. & Palau, R. (2016). Análisis de la implementación de Flipped Classroom en las asignaturas instrumentales de 4º Educación Secundaria Obligatoria. *EduTec. Revista Electrónica de Tecnología Educativa*, 55. doi:10.21556/edutec.2016.55.733
- Borrego, F.J., Carrillo, A.B., & Díaz, A. (2015). Análisis descriptivo de la práctica físico-deportiva e intereses de práctica en escolares de 5º y 6º de primaria. *Revista Euroamericana de Ciencias del Deporte*, 4(1), 23-28. doi: 10.6018/239
- Casey, A. (2016). Models-Based Practice. In C.D. Ennis (ed.). *Handbook of Physical Education Pedagogy* (pp.54–67). London: Routledge. doi:10.1080/17408989.2018.1429588
- Castejón Oliva, J. (2015). La investigación en iniciación deportiva válida para el profesorado de educación física en ejercicio (Research on sports initiation valid for physical education teachers in-service). *Retos*, 0(28), 263-269. Recuperado de <https://recyt.fecyt.es/index.php/retos/article/view/35535>
- Chen, K. S., Monrouxe, L., Lu, Y. H., Jenq, C. C., Chang, Y. J., Chang, Y. C., & Chai, P. Y. C. (2018). Academic outcomes of flipped classroom learning: a meta-analysis. *Medical education*, 52(9), 910-924. doi:10.1111/medu.13616
- Chen, Y., Wang, Y., & Chen, N. S. (2014). Is FLIP enough? Or should we use the FLIPPED model instead? *Computers & Education*, 79, 16-27. doi: 10.1016/j.compedu.2014.07.004
- Clark, K. (2015). The Effects of the Flipped Model of Instruction on Student Engagement and Performance in the Secondary Mathematics Classroom. *The Journal of Educators Online*, 12(1). doi:10.9743/jeo.2015.1.5
- Crum, B. (1988). A Critical Analysis of Korfball as a "Non-Sexist Sport." *International Review for the Sociology of Sport*, 23(3), 233–241. doi: 10.1177/101269028802300305
- Davies, R.S., Dean, D.L. & Ball, N. (2013). Flipping the Classroom and Instructional Technology Integration in a College-Level Information Systems Spreadsheet Course. *Educational Technology Research and Development*, 61(4), 563-580. doi: 10.1007/s11423-013-9305-6
- El-Banna, M. M., Whitlow, M., & McNelis, A. M. (2017). Flipping around the classroom: Accelerated Bachelor of Science in Nursing students' satisfaction and achievement. *Nurse education today*, 56(1), 41-46. doi: 10.1016/j.nedt.2017.06.003
- Fautch, J. M. (2015). The flipped classroom for teaching organic chemistry in small classes: is it effective? *Chemistry Education Research and Practice*, 16(1), 179–186. doi:10.1039/c4rp00230j
- Fernandez-Río, J., Calderón, A., Hortigüela Alcalá, D., Pérez-Pueyo, A. & Aznar-Cebamanos, M. (2016). Modelos pedagógicos en educación física: consideraciones teórico-prácticas para docentes. *Revista Española de educación física y Deportes*, 413(2), 55-75.
- Fernández-Río, J., & Méndez-Giménez, A. (2015). El Aprendizaje Cooperativo: Modelo Pedagógico para educación física (Cooperative learning: Pedagogical Model for Physical Education). *Retos*, 29 (1), 201-206.
- Ferriz, A., Sebastià, S., & García-Martínez, S. (2017) Clase invertida como elemento innovador en educación física: Efectos sobre la motivación y la adquisición de aprendizajes en Primaria y Bachillerato. En R. Roig (Ed.), *Investigación en docencia universitaria. Diseñando el futuro a partir de la innovación educativa* (pp. 211-233). Barcelona, España: Ediciones Octaedro.
- Fierro S., Haro A., & García V. (2016). Los deportes alternativos en el ámbito educativo. *Revista de Educación, Motricidad e Investigación*, 6, 40-48.
- Fornons, V. & Palau, R. (2016). Flipped Classroom en la asignatura de matemáticas de 3º de Educación Secundaria Obligatoria. *EduTec. Revista Electrónica De Tecnología Educativa*, (55), a322. doi:10.21556/edutec.2016.55.284
- Galway, L. P., Corbett, K. K., Takaro, T. K., Tairyan, K., & Frank, E. (2014). A novel integration of online and flipped classroom instructional models in public health higher education. *BMC Medical Education*, 14(1), 181. doi:10.1186/1472-6920-14-181
- García, I. G., Lemus, N. C., & Morales, P. T. (2015). Las flipped classroom a través del smartphone: efectos de su experimentación en educación física secundaria. *Prisma Social*, 15, 296-352.
- Goh, C. F., & Ong, E. T. (2019). Flipped classroom as an effective approach in enhancing student learning of a pharmacy course with a historically low student pass rate. *Currents in Pharmacy Teaching and Learning*. 11(6), 621-629. doi:10.1016/j.cptl.2019.02.025
- Gubby, L. (2018). Does korfball have the potential to resist current gender discourses in PE?: perspectives of junior korfball players. In: AIESEP (International

- Association of Colleges of Physical Education) World Congress, July 2018, Edinburgh.
- Hahnstadt, J. (2014). The Flipped Classroom in Physical Education. In L. Gansel (Ed.), *Flipped Learning: Gateway to student engagement* (pp. 65–74). USA: *International Society for Technology in Education*.
- Heinerichs, S., Pazzaglia, G., & Gilboy, M. B. (2016). Using flipped classroom components in blended courses to maximize student learning. *Athletic training education journal*, 11(1), 54-57.
- Hung, H. T. (2015). Flipping the classroom for English language learners to foster active learning. *Computer Assisted Language Learning*, 28(1), 81-96. doi: 10.1080/09588221.2014.967701
- Jensen, J. L., Kummer, T. A., & Godoy, P. D. D. M. (2015). Improvements from a flipped classroom may simply be the fruits of active learning. *CBE—Life Sciences Education*, 14, 1-12.
- Jewett, A. E., Bain, L. L. & Ennis, C. D. (1995). *The curriculum process in physical education*. Dubuque, IA: Brown y Benchmark.
- Joyce, B. & Weil, M. (1972). *Models of Teaching*. London: Prentice-Hall International.
- Killian, C. M., Trendowski, T. N., & Woods, A. M. (2016). *Students' perceptions of flipped instruction in a university physical activity course*. AIESEP International Conference, Laramie, WY, USA
- Kretschmann, R. (2015). Physical education teachers' subjective theories about integrating information and communication (ICT) into physical education. *The Turkish Online Journal of Educational Technology*, 14(1), 68-96.
- Lleixà, T. (2017). Didáctica de la educación física: nuevos temas, nuevos contextos. *Didactae*, 2, 2-5. doi:10.1344/did.2017.2.2-5
- Long, T., Cummins, J., & Waugh, M. (2017). Use of the flipped classroom instructional model in higher education: instructors' perspectives. *Journal of computing in higher education*, 29(2), 179-200. doi:10.1007/s12528-016-9119-8
- McLaughlin, J. E., Roth, M. T., Glatt, D. M., Gharkhonarehe, N., Davidson, C. A., Griffin, L. M., & Mumper, R. J. (2014). The flipped classroom: a course redesign to foster learning and engagement in a health professions school. *Academic medicine*, 89(2), 236-243. doi: 10.1097/ACM.0000000000000086
- Metzler, M. (2011) *Instructional models for physical education* (3rd ed.). Scottsdale, Arizona: Holcomb Hathaway.
- Moraros, J., Islam, A., Yu, S., Banow, R., & Schindelka, B. (2015). Flipping for success: evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC medical education*, 15 (1), 15-27. doi:10.1186/s12909-015-0317-2
- Morilla, F., & Palau, R. (2015). Flipped classroom en la Educación Física. *Comunicación y pedagogía: Nuevas tecnologías y recursos didácticos*, 285, 64-67.
- Mosston, M. (1966). *Teaching physical education: From command to discovery*. Columbus, Ohio: Charles E. Merrill.
- O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education*, 25, 85–95. doi: 10.1016/j.iheduc.2015.02.002
- Papastergiou, M. (2010). Enhancing Physical Education and Sport Science students' self-efficacy and attitudes regarding Information and Communication Technologies through a computer literacy course. *Computers & Education* 54, 298–308.
- Prat, Q., Camerino, O., Castañer, M., Andueza, J., & Puigarnau, S. (2019). The Personal and Social Responsibility Model to Enhance Innovation in Physical Education. *Apunts. Educación Física y Deportes*, 136, 83-99. doi:10.5672/apunts.2014-0983.es.(2019/2).136.06
- Requena, Ó. (2008). Juegos alternativos en educación física: flag football. *Revista Digital Innovación y Experiencias Educativas*, 4. Recuperado de <http://docplayer.es/20871787-Juegos-alternativos-en-educacion-fisica-flag-football.html>
- Richey, R. C., Klein, J. D. & Tracey, M. W. (2011). *The Instructional Design Knowledge Base. Theory, Research, and Practice*. New York: Routledge.
- Rodríguez, J.; Radío, D. & Rivadas, M. (2018). Desarrollo curricular del bloque de juegos y deportes en educación física en educación primaria. *Revista Digital de educación física*, 55, 77-96.
- Sams, A., & Bergmann, J. (2013). Flip your students' learning. *Educational leadership*, 70 (6), 16-20.
- Sargent, J., & Casey, A. (2019). Flipped learning, pedagogy and digital technology: Establishing consistent practice to optimise lesson time. *European Physical Education Review*. doi:10.1177/1356336X19826603
- Sheskin D.J. (2007). *Handbook of Parametric and Nonparametric Statistical Procedures*. 4th ed. Boca Raton, FL: Chapman y Hall/CRC.
- Simón, J., Ojando, E.S., Àvila, X., Prats, M.A., & Miralpeix, A. (2016). Percepció dels estudiants i del professorat del Grau d'Educació Primària de Blanquerna - Universitat Ramon Llull sobre la incorporació experimental de la flipped classroom. *ALOMA Revista de Psicologia, Ciències de l'Educació i de l'Esport*, 34(1), 45-52
- Sohrabi, B., & Iraj, H. (2016). Implementing flipped classroom using digital media: A comparison of two demographically different groups perceptions. *Computers in Human Behavior*, 60, 514-524.
- Stidder, G & Hayes, S. (2017). *The Really Useful Physical Education Book: Learning and Teaching Across the 11-16 Age Range*. London: Routledge.
- Summerfield, K., & White A. (1989). Korfbal: A Model of Egalitarianism? *Sociology of Sport Journal*, 6 (2), 144-151.
- Tamir, P., & Amir, R. (1981). Retrospective curriculum evaluation: An approach to the evaluation of long-term effects. *Curriculum inquiry*, 11(3), 259-278.
- Tourón, J., & Santiago, R. (2015). El modelo Flipped Learning y el desarrollo del talento en la escuela Flipped Learning model and the development of talent at school. *Revista de Educación*, 368 (2), 196-231. doi:10.4438/1988-592X-RE-2015-368-288

- Tourón, J., Santiago, R., & Díez, A. (2014). *The Flipped Classroom: Cómo convertir la escuela en un espacio de aprendizaje*. Madrid: Group Océano.
- Tune, J. D., Sturek, M., & Basile, D. P. (2013). Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology. *Advances in physiology education*, 37(4), 316-320. doi: 10.1152/advan.00091.2013
- Usabiaga, O., & Martos-García, D. (2012). La tradición lúdica en el currículum educativo. Los juegos y deportes de pelota en educación física: una propuesta comprensiva. *Apunts, educación física y Deportes*, 107, 31-40.
- Van Bottenburg, M. & Vermeulen, J. (2011). Local Korfbal versus Global Basketball: a Study of the Relationship between Sports' Rule-Making and Dissemination. *Ethnologie française*, 41(4), 633-643. doi:10.3917/ethn.114.0633
- Wanner, T. & Palmer, E. (2015). Personalising learning: Exploring student and teacher perceptions about flexible learning and assessment in a flipped university course. *Computers and Education*, 88, 354-369. doi:10.1016/j.compedu.2015.07.008
- Wong, T. H., Ip, E. J., Lopes, I., & Rajagopalan, V. (2014). Pharmacy students' performance and perceptions in a flipped teaching pilot on cardiac arrhythmias. *American journal of pharmaceutical education*, 78(10), 185. doi: 10.5688/ajpe7810185
- Yarbro, J., Arfstrom, K. M., McKnight, K., & McKnight, P. (2014). *Extension of a review of flipped learning*. Flipped Learning Network/Pearson/George Mason University.
- Wilson, S. G. (2013). The flipped class: A method to address the challenges of an undergraduate statistics course. *Teaching of psychology*, 40(3), 193-199. doi: 10.1177/0098628313487461
- Zainuddin, Z., & Halili, S. H. (2016). Flipped classroom research and trends from different fields of study. *The International Review of Research in Open and Distributed Learning*, 17(3), 313-340.
- Østerlie, O. (2016). Flipped learning in physical education: Why and how? In D. Novak, B. Antala, & D. Knjaz (Eds.), *Physical education and new technologies* (pp. 166-176). Zagreb: Croatian Kinesiology Association.
- Østerlie O (2018) Can flipped learning enhance adolescents' motivation in physical education? An intervention study. *Journal for Research in Arts and Sports Education* 2(1), 1-15.